How to make believe

Inquisitivity, veridicality, and evidentiality in belief reports

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Intro to clausal embedding

Predicates which encode mental attitudes or speech acts, such as *believe*, *hope*, and *wonder*, can embed clauses:

(1)   a.   Kira **believes** that the aliens are prophets.
          b.   Ben **hopes** that he can protect the wormhole.
          c.   Jadzia **wonders** whether they will succeed.

Sentences like (1), (minimally) containing of an clausal-embedding (CE) predicate and an embedded clause: **attitude reports**

Distribution of attitude reports

CE predicates also differ in the *types* of clauses they can select (or 'embed').

Some predicates embed only declaratives (2), some embed only interrogatives (3), and some either (4):

(2) a. The Federation **hopes/thinks** that victory will come.
     b. *The Federation **hopes/thinks** when victory will come.

(3) a. *The Federation **investigated/wondered** that victory will come.
     b. The Federation **investigated/wondered** when victory will come.

(4) a. The Federation **knows/said** that victory will come.
     b. The Federation **knows/said** when victory will come.

Types of attitudes

Notational shorthand (courtesy of Lahiri 2002):

	Embeds declaratives	**Embeds interrogatives**
Anti-rogative	✓	✗
Rogative	✗	✓
Responsive	✓	✓

A major question: how should we account for this variation in clausal-embedding behavior?

A question of selection

One possible analysis is that CE predicates are simply lexically specified for the kind(s) of clauses they can embed.

Standard view: Declarative clauses denote propositions (type st) & interrogative clauses denote questions (type $\langle st, t \rangle$) (Karttunen, 1977, *et seq.*)

The difference between *hope* and *wonder* is accounted for by their different s(emantic)-selectional properties:

(5)   a. $[\![hope]\!] = \lambda p_{st} \lambda x_e \lambda w_s.\textbf{hope}(p)(x)(w)$
      b. $[\![wonder]\!] = \lambda q_{\langle st,t \rangle} \lambda x_e \lambda w_s.\textbf{wonder}(q)(x)(w)$

$\rightarrow$ Combining a lexical item with something it does not s-select = impossible derivation (Grimshaw, 1979; Pesetsky, 1982, 1991)

Problems for the selectional view

This idea is not sufficient to account for variation in CE predicates for several reasons:

- ❖ CE predicates with similar meanings have similar syntactic properties within/across languages (Bolinger, 1968; Cattell, 1978; Heim, 1992, a.m.o.)
- ❖ Responsive predicates like *know* can embed both declaratives and interrogatives (Karttunen, 1977; Groenendijk & Stokhof, 1984; Lahiri, 2002, a.o.)
- ❖ Many CE predicates also embed nominals in addition to clauses (Vendler, 1972; Ginzburg, 1995; King, 2002; Moltmann, 2013; Uegaki, 2016, a.o.)

In other words, s-selection alone does not really tell us the 'why' of variation in CE predicates.

Main claim of the dissertation

Embedded clauses are all typewise identical. Restrictions on the syntax of CE predicates follows not from s-selection, but:

- Certain combinations of predicates/clauses results in systematically trivial meanings and therefore unacceptability

  (Gajewski, 2002; Elliott, 2017; Theiler et al., 2018; Mayr, 2019)

- General semantico-pragmatic restrictions on the interaction between presupposed and at-issue content

- The presence or absence of arguments whose only contribution is presuppositional influences how verbs compose with embedded clauses

Evidence

Evidence for these claims comes from close examination of belief predicates in English and Estonian:

- 🞣 Responsive predicates whose interpretation radically shifts depending on the type of clause they embed (Estonian *mõtlema*)
- 🞣 Predicates which embed interrogatives only in the scope of certain linguistic operators (*believe* vs. *can't believe*)
- 🞣 Nominal-embedding behavior also tracks semantics of CE predicates closely, and can predict features of their CE use (**today**)

The puzzle of *believe DP*

Nominal-embedding attitudes

Many English CE predicates can also embed content DPs, as opposed to only clauses: (Vendler, 1972; King, 2002; Uegaki, 2016)

⋆ Content nominals: those which can be modified by *that*-clauses (*the claim*, *the rumor*,...)

(6)   a.   Lucretia believes/denies/confirmed [that she is Elena Ferrante]$_{CP}$.

        b.   Lucretia believes/denies/confirmed [the rumor/claim/story/lie]$_{DP}$.

Nominal-embedding attitudes

Some verbs, such as *believe* and *trust* can also take non-content DPs as objects, in which case the DP is roughly interpreted as the 'source' of the attitude: (Djärv, 2019)

(7)   Lucretia believes the seer/the book/Maude.
        ≈ Lucretia believes {the seer/the book/Maude}**'s claim**

Content vs. non-content DPs

While a *content-DP + CP* sequence can be plausibly analyzed as a single constituent, the same is not true of non-content DPs:

(8) a.   John believes [the rumor that Mary left]$_{DP}$.

  b.   *John believes [Mordecai that Mary left]$_{DP}$.

But *believe-DP-CP* with a non-content DP are grammatical!

(9)   John believes [Mordecai]$_{DP}$ [that Mary left]$_{CP}$

The puzzle: How do we compose *believe* with the embedded clause in (9) when there is an intervening DP?

This is a challenge for most theories of clausal embedding, which have clauses saturating internal arguments of CE predicates.

For example, a 'standard' Hintikkan (1962, 1969) semantics for *believe* cannot account for an object DP in addition to an embedded clause:

(10) $[\![believe]\!] = \lambda p_{st} \lambda x_e \lambda w_s . \text{DOX}_x^w \subseteq p$

Why does this problem matter?

This is **not** a lexical idiosyncrasy of *believe*. Verbs which can embed non-content DP + CP sequences form clear semantic classes:

(11)   a.   **Verbs of credence**: *agree (with), cite, corroborate, have confidence (in), take at face value, trust...*
        b.   **Verbs of discredence**: *contradict, counter, disagree (with), dispute, doubt, question, rebut...*

What these verbs have in common: expressing evaluation of the validity of a particular body of information.

$\rightarrow$ We want to establish a connection between the semantic features of this class and participation in the *V DP CP* construction.

Focus for today: *believe*

What does *believe DP* mean?

Entailment patterns

In a context where *believe DP CP* is true, so are *believe DP* and *believe CP*, regardless of whether the DP is content-denoting or not.

(12)　John believes the rumor that Mary left.
　　　$\vDash$ John believes that Mary left.
　　　$\vDash$ John believes the rumor.

　　　(Uegaki 2016:626)

(13)　John believes Mordecai that Mary left.
　　　$\vDash$ John believes that Mary left.
　　　$\vDash$ John believes Mordecai.

　　　(Djärv 2019:210)

What can be *believed*

Only non-content DPs which denote conversational agents (like people) and repositories of information (like books) make good objects of *believe*.

(14)   John believes Mary/the book/the cardiologist/#the crime scene/#the bloody glove that Agatha is the murderer.

The common bond: object DPs of *believe* must be capable of making *assertions*

The assertive requirement

This becomes especially clear when we see the impossibility of the non-content DP being the 'source' of a relevant belief if they did not make a particular speech act:

(15) ***Indirect inference context****: John knows that whenever Mary leaves a party, Mordecai leaves shortly after, though he would never leave early otherwise. John, who has no knowledge of Mary's whereabouts, is waiting outside a party and sees Mordecai leave.*
#John believes Mordecai that Mary left.

It is not enough for this assertion to exist, but it must also be the *source* of the relevant belief.

(16)   ***Coincidental assertion context****: Mordecai tells John that Mary left, but John already knew that*.
         #John believes Mordecai that Mary left.

Finally, the assertion required by *believe* with a non-content DP is presupposed to exist, and projects past typical presupposition holes:

(17)   a.   John doesn't believe Mordecai that Mary left.
      b.   Does John believe Mordecai that Mary left?
      c.   If John believes Mordecai that Mary left, then he will have an accurate headcount.
        ⊨ Mordecai claimed that Mary left.

1. *x believe y that p*, where *y* is a non-contentful entity, presupposes that:
   - *y* made the claim that *p*
   - *y*'s claiming that *p* would lead *x* to believe that *p*.
2. *x believe y that p* entails *x believe y* and *x believe p*.

A solution to the puzzle

Preview of the solution

- ✤ *Believe* selects for an *evidential source* argument **in addition to** a clausal argument.
- ✤ The source argument can be explicitly saturated by an object DP
- ✤ The type of the source argument is that of a contentful entity (type *c*; $D_c \subset D_e$) (cf. Hacquard 2006, 2010)
- ✤ In cases where *believe* does not take a direct object, the source argument is existentially closed

Response-stance verbs

In effect, *believe* will be treated as a weak 'response-stance verb'.

These verbs are CE predicates which presuppose a prior assertion of the embedded clause. (Cattell, 1978; Hegarty, 1990; Kastner, 2015)

(18)   We **denied/agreed/confirmed/verified** that the cookies were ready.
Presupposed: Someone claimed that the cookies were ready.

Believe differs from other such verbs in does not *always* presuppose such an assertion, but only when it takes a DP object.

A sentence of the form *x believe y that p* has the following meaning:

At-issue: *x*'s doxastic state (the set of worlds compatible with their beliefs) entails *p*

Presupposed:
- *y* refers to (at some level) an assertion
- The content of *y* entails *p*
- *x* is acquainted with (aware of) *y*
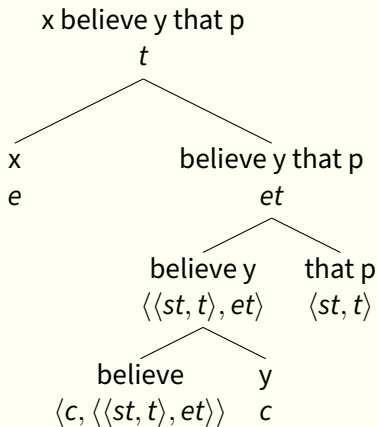- *x* would not believe *p* if not for their acquaintance with *y*

Formalization

Assumption: declarative & interrogative clauses both denote downward-closed sets of sets of worlds ($\langle st, t \rangle$), as in Inquisitive Semantics (Ciardelli et al., 2013; Theiler et al., 2018)

(19) $[\![\text{believe}]\!]^w = \lambda y_c.\lambda p_{\langle st,t \rangle}.\lambda x_e.\text{DOX}_x^w \in p$

$$\left\{ \begin{array}{l} \text{defined if 1) } \text{CON}(y) \in p \\ \qquad\qquad 2) \text{ ACQ}(x)(y)(w) \\ \qquad\qquad 3) \forall w'[w' \in max_{\leq,w}(\neg\text{ACQ}(x)(y))][(\neg\text{DOX}_x^{w'} \in p)] \\ \# \text{ otherwise} \end{array} \right\}$$

The third component is a Lewisian counterfactual, where:

(20)   a.   For worlds w', w'', $w' \leq_w w''$ iff w' is more similar to w than w'' is to w.

   b. $max_{\leq,w}(p) = \{w' : p(w') = 1 \land \forall w''[p(w'') = 1][w' \leq_w w'']\}$

   (von Fintel 2001:126)

x believe y that p
t

x   believe y that p
e et

believe y   that p
$\langle\langle st, t\rangle, et\rangle$ $\langle st, t\rangle$

believe   y
$\langle c, \langle\langle st, t\rangle, et\rangle\rangle$ c

Restrictions on object DPs

Believe selects for a contentful entity, here defined as an entity which can be identified with a singular propositional content.

This entity is the 'source' of the relevant belief.

I assume that content DPs (*the rumor*, *the idea*...) denote contentful entities inherently.

Composing with non-content DPs

Non-content DPs capable of making assertions (*John*) are possible objects of *believe*, but are the wrong type (*e* as opposed to *c*).

Solution: An *e*-type entity *x* can be coerced into a *c*-type entity corresponding roughly to '*x*'s claim', due to a compositional rule:

(21)   **FA with contentful entity coercion**
         For α of type *e* and β of type $c \rightarrow \tau$ (where τ is any type),
         $\beta(\alpha) = \beta(\text{CLAIM}(\alpha))$ (cf. Pustejovsky 1995)

(22) $[\![\text{CLAIM}]\!]^w = \lambda x_e . \iota y_c [\textbf{claim}(y)(w) \land \text{AUTH}(y)(w) = x]$

Composition with a DP and a CP

(23)   Mary believes Janet that the cookies are ready.

The non-content DP *Janet* must be coerced into a *c*-type object referring to her specific claim.

(24) $\mathbf{jclaim} := \iota y_c[\mathbf{claim}(y)(w) \wedge \text{AUTH}(y)(w) = j]$
       $\approx$ 'the claim that Janet made in w'

(25) $\llbracket (23) \rrbracket^w = \text{DOX}_m^w \in \{w' : \text{ cookies ready in } w'\}^{\downarrow}$

$$\left\{ \begin{array}{l} \text{defined if 1) } \text{CON}(\mathbf{jclaim}) \in \{w' : \text{ cookies ready in } w'\}^{\downarrow} \\ \qquad\qquad 2) \text{ ACQ}(m)(\mathbf{jclaim})(w) \\ \qquad\qquad 3) \forall w'[w' \in max_{\leq,w}(\neg\text{ACQ}(m)(\mathbf{jclaim})(w)) \\ \qquad\qquad [(\neg\text{DOX}_m^{w'} \in \{w'' : \text{ cookies ready in } w''\}^{\downarrow})] \\ \text{\# otherwise} \end{array} \right\}$$

(26)   Mary believes that the cookies are ready.

Believe cannot directly compose with the embedded clause without a type mismatch; the content argument is in the way.

Proposal: This argument of *believe* can be interpreted existentially, analogous to internal arguments of verbs like *eat* (e.g. Williams 2015)

(27) $[\![\text{Mary ate}]\!] = \exists x[\mathbf{eat}(m)(x)]$

Presupposition accommodation

Formally, this can be achieved many ways, e.g. existentially closing the content argument of *believe*.

(28)   Mary believes that the cookies are ready.

(29) $[\![(28)]\!]^w = \text{DOX}_m^w \in \{w' : \text{cookies ready in } w'\}^{\downarrow}$

$$\left\{ \begin{array}{l} \text{defined if } \exists y \text{ s.t. } 1) \text{CON}(y) \in \{w' : \text{cookies ready in } w'\}^{\downarrow} \\ \qquad\qquad\qquad 2) \text{ACQ}(m)(y)(w) \\ \qquad\qquad\qquad 3) \forall w'[w' \in max_{\leq,w}(\neg\text{ACQ}(m)(y)(w)) \\ \qquad\qquad\qquad\quad [(\neg\text{DOX}_m^{w'} \in \{w'' : \text{cookies ready in } w''\}^{\downarrow})] \\ \text{\# otherwise} \end{array} \right\}$$

The presupposition that 'there is some particular evidence for Mary's belief that p' is *very* weak given that Mary believes p.

$\rightarrow$ People don't tend to form beliefs out of thin air, so this presupposition is easily accommodated.

Composition without a CP

Believe can also occur without a clausal complement:

(30)   Mary believes Janet.

The embedded clause is obligatorily interpreted as pragmatically recoverable, similar to DOs of *win* and *watch*.

(31) $[\![$ Lucy won $]\!]$
         $\approx$ Lucy won *some particular salient competition*

If a similar mechanism is at play in (30), the propositional argument of *believe* refers to a salient proposition in the discourse context.

Composition with no internal argument

I have proposed that both the source argument and the clausal argument are both optional:

- ❖ **Source Argument**: Can be interpreted existentially
- ❖ **Clausal Argument**: Can be implicit iff pragmatically recoverable

However, *believe* cannot occur without at least one of these arguments expressed overtly:

(32)   *Mary believes.

This remains an open question under the present account.

Welcome consequences

Predicates of Personal Taste

Predicates of personal taste (PPTs): descriptions like *tasty*, *good*, etc., that require a 'judge' to be interpreted

PPTs under *believe* give rise to the anomalous interpretation that the attitude holder (subject) is not the judge:

(33)   *Context: **A**listair, **B**elinda, and **C**andace are at a potluck. **A** and **B** brought a cake, and surreptitiously watch from across the room as **C** tries it. **C**'s face lights up. Relieved, **A** says:*

     a.   Candace thinks that the cake is tasty!

     b.   #Candace believes that the cake is tasty!

            (adapted from Stephenson 2007:63)

This points to a restriction on the content argument of *believe* s.t. it cannot be the attitude holder's sensory experience.

If the judge of tastiness *is* someone besides the attitude holder, they can indeed correspond to a direct object DP:

(34)   *Context: **D**ante eats the cake before Candace and tells her that it's delicious. **D** has a refined palate so **C** takes his word for it.*
        Candace believes Dante that the cake is tasty.

Accepting assertions

The evidential presupposition of *believe* can also explain contrasts in its pragmatic use with *think*.

For example, a speaker can use an utterance of *I believe that* to accept a preceding assertion at face value, but not *I think that*:

(35)   *Context: Kelsey is unfamiliar with Caucasian writing
       systems. Steven is an expert.*
       S: Fun fact! Laz uses the Georgian alphabet.
       K: I believe that.
       K': #I think that.

I think that gives the impression Kelsey already knew Laz uses the Georgian alphabet. Why?

This can be explained with a pragmatic constraint like Maximize Presupposition, which requires speakers to use presuppositional alternatives, all else being equal. (Heim, 1994)

Assumption 1: *I believe that* and *I think that* both communicate the at-issue meaning that *I believe that Laz uses the Georgian alphabet.*

Assumption 2: *Think* does not have an evidential presupposition

If Kelsey does in fact believe *p* **on the basis of Steven's claim**, she must indicate as such by use of *believe* instead of *think*.

A point of skepticism

Declarations of religious belief do not seem like they necessarily require evidence:

(36)   a.   I believe that all men are created equal.
           b.   Deep down, she believes that God will save her.

This might seem to be at odds with the idea that *believe* lexically encodes an evidential presupposition.

I propose that examples like (36) **really do** involve evidence-based beliefs, but the definition of 'evidence' which *believe* requires is extraordinarily permissive.

The nature of evidence

Use of a first person subject with *believe* is degraded if the speaker is unaware of the source of that belief.

(37)   a. ?I believe that it's raining but I don't know why I believe that it's raining.

          b. I think that it's raining but I don't know why I think that it's raining.

(38)   a. #I believe that it's raining but I don't have any reason for believing that.

          b. I think that it's raining but I don't have any reason for thinking that.

An alternative approach

Where is the evidential presupposition?

An alternative solution to derive *believe DP*: introduce non-content DPs with a functional head, like an applicative (Djärv, 2019, 2021)

Under this view, no need to explain why *believe DP* is presuppositional in a way that *believe* on its own does not seem to be.

The propositional argument of *believe* can either be saturated by an embedded clause or a content DP (cf. Uegaki 2016)

In German, non-content DPs under *believe* receive dative case, but content DPs receive accusative:

(39)   a.   Ich glaube   ihr/*sie,   dass Maria ein Genie
              I   believe her.DAT/ACC that   Maria a   genius
              war.
              was
              'I believe her that Mary was a genius.'
       b.   Ich glaube   die/#der   Behauptung, dass Maria
              I   believe the.ACC/DAT claim   that   Maria
              ein Genie   war.
              a   genius was
              'I believe the claim that Mary was a genius.'
              (Djärv 2019: 235)

German sources

This patterns with dative case marking of optional 'source' arguments with other verbs, a construction generally available in German:

(40)   Hans stahl Maria   das   Buch.
        Hans stole Maria.DAT the.ACC book
        'Hans stole the book from Maria.'

(Schäfer 2008: 76)

In Djärv's (2019, 2021) analysis, (40) is assumed to be syntactically similar to *believe her*.

$\rightarrow$ The object DP of *believe* is introduced by an applicative head that introduces a *source* argument.

Problem 1: Overgeneration

If an unselected functional head is introducing the source argument of *believe*, any CE predicate should permit embedded DPs but this is not so:

(41)   *I think Consuelo (that it's raining).

Think can embed other DPs, like 'special quantifiers', free relatives, and propositional anaphors: (Moltmann, 2013; Elliott, 2017)

(42)   a.   Garnet thinks [something]$_{DP}$.
        b.   Garnet thinks [whatever her mother thinks]$_{DP}$.
        c.   Garnet thinks [that]$_{DP}$.

Problem 2: Cross-linguistic variation

In Estonian, *believe DP CP* is licit, but the DP receives partitive (direct object) case regardless of whether it is a content nominal or not:

(43)   a.   Ma usun   Liisi/*Liisile/*Liisilt, et
                I   believe Liis.PART/ALL/ABL   that
                koroonaviirus on ohtlik.
                coronavirus   is   dangerous
                'I believe Liis that coronavirus is dangerous.'

        b.   Õpetaja usub   valet/*valele/*valelt, (et ma
                teacher believes   lie.PART/ALL/ABL   that I
                haige olen).
                sick am
                'The teacher believes the lie (that I am sick).'

Problem 2: Cross-linguistic variation

This is different from the ablative case a source DP receives with a
verb like *varastama* 'steal'.

(44)   Keegi   varastas temalt   raha.
        someone stole   3SG.ABL money.ACC
        'Someone stole money from him.'

→ The two source constructions cannot be unified in every
language.

Cross-linguistic variation

However, case may still play a role. For example, Russian:

(45) a. Ja verju [tomu   chto byli fal'sifikacii].
          I believe that.DAT COMP were falsifications
          'I believe that there were falsifications.'
          (Presupposed: there was a claim that there were
          falsifications)
      b. Ja verju [chto byli fal'sifikacii].
          I believe COMP were falsifications
          'I believe that there were falsifications.'
          (No pre-existing claim necessary)

          Tanya Bondarenko, p.c.

$\rightarrow$ We cannot necessarily use cross-linguistic evidence in arguing
for an English analysis.

Upshots

The proposal is that *believe* takes an evidential argument, even when this argument is not made overt.

This complex lexicalization is preferable to an alternative analysis where this argument is introduced by a functional head.

- ❖ This predicts the construction to be more widely available than it is
- ❖ The connection with the semantics of predicates which allow the construction is lost

This argument can also explain nuance in the semantic/pragmatic profile of *believe p* in comparison to superficially similar *think p*.

Looking ahead

Revisiting the main points

- Syntax follows the semantics: CE behavior of a predicate is predicted by its meaning.
- We cannot fully understand the semantic behavior of a word without examining it in a wide variety of contexts
- The behavior of CE predicates with non-clausal arguments bears much closer scrutiny, **and can inform our understanding of CE predicates more generally**
- The role of selection in understanding CE predicates is relatively small; we can explain their behavior without resorting to such lexical stipulations

Why examine individual words?

Studying individual verbs under a microscope can sound navel-gazey.

But! Identifying lexical semantic classes has been enormously successful in developing other syntactic generalizations
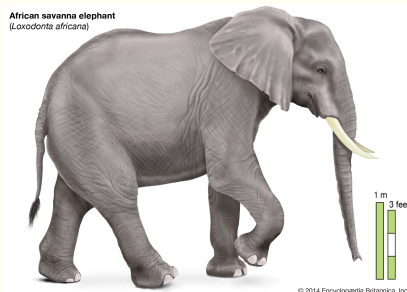
(e.g. argument structure, see Levin 1993 a.m.o.)

→ This requires a considerable extent of 'in the weeds' work on lexical meaning.

CE predicates occupy a unique niche, because they interact directly with the *meanings of clauses*, and thus can be illuminating for clausal semantics as well.

There is a famous story in which a group of blind men encounter this beast:

African savanna elephant
(*Loxodonta africana*)

1 m
3 feet

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The men each examine a different part of the creature, and come to wildly different conclusions about its nature.

The elephant problem

In order to fully understand CE predicates, we need to look at their behavior in **the widest possible range** of linguistic environments.

$\rightarrow$ It would be difficult to detect evidential restrictions on *believe* without examining its nominal-embedding use.

$\rightarrow$ Linguistic operators like negation above CE predicates affect their embedding behavior (Mayr, 2019; Roberts, To appear)

The cross-linguistic picture

An ultimate goal: Understanding what is responsible for variation, and lack of variation, in CE predicates across languages.

Most languages have hundreds if not thousands of CE predicates, so identifying semantic classes is a necessity for tractability of the problem.

Big data and large-scale internet studies can help! (White & Rawlins, 2016, 2020)

CE predicates have only been examined systematically in a very small number of languages, a gap which needs to be filled (this is changing!)

What does this mean for syntax?

Finally, linguists have long distinguished between syntactic and semantic well-formedness:

(46)   a. #Colorless green ideas sleep furiously.
        b. *Furiously sleep ideas green colorless.

          (Chomsky, 1957)

It is not at all clear that introspective judgments are systematically similar to this difference (see Abrusán 2019 and citations within)

If we don't need selection to account for clausal embedding behavior...

Could we reduce other questions of grammaticality to semantics or pragmatics?

Thank you/Aitäh!